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(54) Title: CLAMPING DEVICE, SUSPENSION DEVICE AND METHOD

(57) Abstract: The present invention relates to a clamping device for clamping thereof between two surfaces arranged at an angle, such as walls, wherein the device comprises: - a biasing body for imparting a bias to the clamping device, - at least three engaging members arranged at respective suitable engaging positions arranged on the biasing body, wherein - the biasing body is manufactured from a plate-like resilient material. The present invention preferably also comprises a method for manufacturing such a clamping device, comprising steps for: - providing a plate material as starting material, - removing the material for the biasing body from the plate material, - forming the engaging members preferably together with the removal step.

Clamping device, suspension device and method

The present invention relates to a clamping device for clamping thereof between two surfaces arranged at an angle, such as walls. The present invention also relates to a suspension device comprising such a clamping device. The present invention further relates to a method for manufacturing a device according to the present invention.

It is known to clamp a device between walls arranged at right angles to each other in order to suspend objects by means of such a device. The non-prepublished patent application NL 1035777 of the same inventor as the present invention is an example hereof. Such a device provides a simple method of suspending objects but, compared to the device according to the present invention, is intended for large objects or long-term use. This device comprises a hinge and is therefore a relatively complex assembly.

The present invention has for its object to provide a relatively simple solution for relatively small-scale applications. The present invention provides for this purpose a clamping device for clamping thereof between two surfaces arranged at an angle, such as walls, wherein the device comprises:

- a biasing body for imparting a bias to the clamping device,
- at least three engaging members arranged at respective suitable engaging positions arranged on the biasing body, wherein:
- the biasing body is manufactured from a resilient material bendable in one direction.

An advantage of such a clamping device on the basis of a biasing body of a resilient material which is bendable in one direction and has at least three engaging members is

that it achieves a very stable fit between the two walls. It is possible by means of simple deformation of the biasing body to position the biasing body between the walls, after which, when the biasing body is released, the deformation is partially reversed until the engaging members engage on the walls and the clamping device is fixed. This device is on the one hand simple to operate and can on the other be mounted in very reliable manner between the walls.

In a first preferred embodiment the biasing body is manufactured from a plate material, preferably comprising at least one opening and/or recess for the purpose of allowing a releasable fastening member to engage thereon. A plate material has the advantage that it is bendable in one direction. In this text the definition of bendable in one direction is that the deformability of the material in one direction is very much greater than the deformability in other directions, as this is for instance the case with a plate material. A further advantage is that the engaging members can be formed in simple manner from the plate material. It is possible to punch the biasing body from a larger piece of plate in a separate processing step, but also even in a single punching step.

In a further preferred embodiment the biasing body is manufactured from a metal and/or the biasing body comprises a leaf spring. In this application such materials provide the great advantage of easy processability and high reliability.

The clamping device more preferably comprises operating means for operating the clamping device by means of fingers and/or hands. Particularly when such operating means move out of the plane of the biasing body, the desired deformation of the biasing body can be effected by means of

a simple squeezing movement. A further advantage is that the movement directed toward each other facilitates placing in a narrow angle between two walls at right angles to each other.

Alternatively, the biasing body comprises a resilient plastic.

The biasing body is more preferably suitable for support in two dimensions, and is preferably suitable for forces in two directions. It hereby becomes possible to allow an object to hang from the clamping device as well as to allow an object to pull on the clamping device. Examples hereof are for instance hanging a painting or decorative ornament or allowing pulling by for instance a streamer such as a birthday streamer.

The biasing body is more preferably suitable for engaging on walls arranged at an angle of 40 degrees to 150 degrees, preferably 70-110 degrees, more preferably 80-100 degrees, and more preferably substantially 90 degrees.

The biasing body is particularly suitable here for forming an arc within the corner, wherein both engaging members are preferably suitable for the purpose of providing a pushing force.

The biasing body is more preferably suitable for engaging on walls arranged at an angle of 210 degrees to 330 degrees, preferably 250-290 degrees, more preferably 260-280 degrees and more preferably substantially 270 degrees.

The biasing body is particularly suitable here for forming an arc around the corner, wherein the engaging members are preferably suitable for the purpose of providing a pulling force.

In a further preferred embodiment the clamping device comprises a releasable fastening member for fastening of an object thereto. Fastening of an object to be fastened to

the clamping device is simplified by such a fastening member. Such a fastening member can for instance provide an eye for fastening a cord or a hook thereto. Such a fastening member preferably comprises a safeguard such as a weakened portion, whereby it will rather be the fastening member that breaks the connection between the object and the clamping device than that the connection between the clamping device and the walls is broken. The safety of the clamping device is hereby enhanced, since possible sharp corners of the engaging members will remain fixed to the walls.

In a first preferred embodiment the releasable connecting member is substantially rod-like and preferably provided with coupling means for fixing to an opening in the biasing body by means of such a connecting member.

Alternatively, the releasable connecting member comprises at least two engaging members for engaging on oppositely arranged sides of the biasing body. It hereby becomes possible to arrange on the biasing body a kind of snap-on engaging member or a loop. An object can for instance be hung or tensioned hereon in simple manner.

In a further embodiment the clamping device comprises shielding members for shielding the engaging members. Specifically in the case of manufacture from a metal plate, the engaging members can be formed from sharp tips. The shielding members shield these when they are not in use. All too simple an injury due to the tips can hereby be prevented.

The clamping device preferably comprises deviation means for reducing a difference in displacement between the engaging members and the shielding members, these deviation means preferably comprising slots arranged in the biasing body. It is hereby possible to realize in simple manner

that in a rest position the shielding members cover the engaging members, while during bending of the biasing body the engaging members leave the protection of the shielding members.

The shielding members are more preferably attached by means of releasable attaching means for the shielding members.

A further aspect according to the present invention relates to a suspension device which according to preferred embodiments is for instance suitable for suspending objects of a maximum of 10 kg, preferably a maximum of 8 kg, more preferably a maximum of 6 kg, more preferably a maximum of 4 kg, more preferably a maximum of 2 kg, more preferably a maximum of 1 kg, more preferably a maximum of 500 g, more preferably a maximum of 250 g.

A further aspect according to the present invention relates to a method for manufacturing a device according to one or more of the foregoing claims, comprising steps for:

- providing a plate material as starting material,
- removing the material for the biasing body from the plate material,
- forming the engaging members preferably together with the removal step.

An advantage of such a method is that a large quantity of biasing bodies can be manufactured from a plate material by means of for instance simple punching operations. Provided for here is that the engaging members can be manufactured with a punching operation together with forming of the biasing bodies. Likewise provided for however is that, depending on the embodiment, two separate operations can be applied for this purpose.

The method preferably comprises steps for supplying the plate material from a roll.

The method preferably comprises steps for forming the operating means by means of forming steps such as injection-moulding. In a further embodiment the method comprises steps for parallel arrangement of a device for the forming step and a device for the removal steps, steps for bringing together the biasing body and the operating means and preferably steps for mounting the operating means on the biasing bodies while the biasing bodies are still partially attached to the roll, and subsequently separating the biasing bodies from the roll.

This embodiment of the method greatly simplifies handling of the biasing bodies during placing of the operating means.

An advantageous manner of mounting the operating means according to a further embodiment is by means of arranging a recess on the biasing body. This recess can advantageously be used for switching on a fitting part of the operating means.

Further advantages, features and details of the present invention will be described in greater detail hereinbelow on the basis of one or more preferred embodiments with reference to the accompanying figures.

Fig. 1A-C show three views of a first preferred embodiment according to the present invention.

Fig. 2A-D show four views of a second preferred embodiment according to the present invention.

Fig. 3A-B show two views of a third preferred embodiment according to the present invention.

Fig. 4A-D show four views of a fourth preferred embodiment according to the present invention.

Fig. 5A-C show a fourth and fifth preferred embodiment according to the present invention.

Fig. 6A-D show a sixth preferred embodiment according to the present invention.

Fig. 7 shows a detail of a further preferred embodiment according to the present invention.

Fig. 8 shows a detail of a further preferred embodiment according to the present invention.

Fig. 9 shows a schematic side view of a further preferred embodiment according to the present invention.

Fig. 10 shows a schematic view of a further preferred embodiment according to the present invention.

Fig. 11A-B show two schematic views of a further preferred embodiment according to the present invention.

Fig. 12 shows a schematic view of a further preferred embodiment according to the present invention.

Fig. 13 shows a schematic view of a further preferred embodiment according to the present invention.

A first preferred embodiment (Fig. 1) according to the present invention relates to a clamping device 1. This comprises a deformable biasing body 2 bendable in the direction of arrows A. This biasing body is therefore bendable in only one dimension, or at least if force is applied in the two other dimensions no bending will take place relative to the bending as shown in Fig. 1A. Engaging points 3, 4, 5, 6 are arranged at the four corners of biasing body 2. Two handles 7, 8 or operating means are fastened by means of screws 9 to the biasing body. Using the handles the biasing body can be bent, whereby the deformation in the direction of arrows A is brought about. With a deformation as shown in Fig. 1A it is possible to place the four tips against the walls arranged at a right angle relative to each other. When the handles are then released, the corner tips will engage on the walls and the device will become fixed between the walls. Because the

deformation of the biasing body is brought about only in the shown direction because of the stiffness of the biasing body, a very strong fixation is realized between the walls.

The same can be achieved with the preferred embodiment of Fig. 2. This also has a biasing body 2 deformable in the direction of arrows A by means of handles. When the biasing body is not deformed, it is substantially flat or straight. The biasing body has four corner points 13, 14, 15, 16 which in the flat state fall inside the respective outer ends 23, 24, 25, 26 of shielding member 22. The shielding member is a preferably plastic, soft or hard plastic body which in the flat state of the biasing body encloses the sharp corner points 13, 14, 15, 16 as shown in Fig. 2D.

In order to provide a great convenience of operation the fastening of the handles and the shielding member by means of screws 9 is realized inside a part of the biasing body bounded by recesses or slots 29. Realized with these slots 29 is that during tensioning of the biasing body the part between the slots with the fastening means 9, and thereby the shielding members, is displaced through a larger angle than points 13, 14, 15, 16. The points are hereby separated as it were automatically from the shielding members. This automatic separation ensures a great user-friendliness during placing of the device between two walls. It is only necessary to squeeze the handles, wherein the points are released and the device can be placed directly in similar manner as in the embodiment of Fig. 1.

In the variant of Fig. 3 the engagement points 33, 34, 35, 36 of device 31 take a multiple form, whereby a stronger coupling to the walls can be realized. Such an embodiment therefore provides a relatively large attaching force.

In the variant of Fig. 4A-D the points 3, 4, 5, 6 have a more pronounced and sharper form. This embodiment is specifically suitable for walls where the points may penetrate to some extent into the walls.

Shown in the variant of Fig. 5A-B is how a shielding member can be attached in simple manner to a biasing body 2. Biasing body 2 is provided for this purpose with two notches or channels 53. Arranged on shielding members 52, 54 are two engaging members 55 which are provided with a connection to the respective shielding members, which connection (not shown) can be placed in channels 53 of biasing body 2.

The variant of Fig. 5C shows a variant similar to that of Fig. 2. The forming of the corner points is however different. In the variant of Fig. 5C corner points are formed by means of bending substantially transversely of the lateral extending direction of the arms on which they are arranged. A relatively great stability is hereby provided in the tensioning direction.

The embodiment of Fig. 6 comprises a biasing body 2 having therein an opening 69 for receiving therein a rod-like connecting member 71 as shown in Fig. 7.

Fig. 7 shows a rod-like connecting member 71 having at one end of the elongate body 72 a blocking knob 73 and at the other end a connecting eye 74. This rod-like connecting member can be arranged in an opening in biasing body 2. A wire for instance can hereby be coupled in simple manner to the clamping member. Connecting member 71 is further provided with a narrowed portion which makes it possible for the connecting member to break off in the case of excessive forces. This breakage will hereby take place sooner than detaching of the clamping member from the walls. This increases safety.

Fig. 8 shows an arcuate connecting member 81. Situated on either side of the elongate curved body 82 are engaging hooks 83, 84. Connecting member 81 can be arranged by means of the hooks over the middle of the biasing body of different preferred embodiments as discussed. Engaging hooks 83, 84 function further as safeguard in the same way as narrowed portion 75. Body 82 is also provided with an eye 85 for attachment of a hook or wire thereto.

Fig. 9 shows a preferred embodiment 81 in accordance with claim 10 or 11. Biasing member 82 extends round walls W so as to allow engagement of points 4, 5 (and 3, 6 not shown). Handles 87, 88 are for this purpose moved by hand in the direction of arrows A, B. The fixing along the outer corner of walls W has substantially the same force as that of the above described preferred embodiments.

Fig. 10 shows a variant of the device wherein arms 23, 24 of a shielding member are enclosed by a holding member 92 arranged round the ends of arms 23, 24. The material properties of holding member 92 are such that a strong grip or friction is achieved relative to the wall. This is possible due to a material with physical properties such as preferably a high elongation at break, a friction coefficient greater than 0.5, preferably greater than 1, preferably greater than 2, more preferably greater than 4. A rubber of great softness is more preferably selected. Examples are, among others, compounds such as:

Lab Recipes

Compound		20100809-C0000	20100810-C0003	20100810-C0004
Description		Epdm-35 grey	Epdm-45 grey	Epdm- 55 black
Density	kg/l	1,043	1,081	1,133
EPDM KELTAN 512		20	50	85
EPDM KELTAN 4551A		160	100	30
Carbon black N-550		0,5	1	3
Silica		45	55	70
Parafinic oil		25	20	20
Processing aid			1	1
Activator		6	6	6
Additives		2	2	2
Coupling agent		2	2	2
Whiting		5	4	
Accelerators		5,45	5,45	4,85
Sulphur		2,75	2,75	2,75
Total lab	phr	273,7	249,2	226,6

Description	*Compound*	*T.S.*	*M 100*	*M 300*	*Elongation*	*C-Set 22H-100°C*	*C-Set 72H-23°C*
		MPa	MPa	MPa	%	%	%
Epdm 35 grey	20100809-C0000	3.4	0.9	2.5	394	33,8	6,7
Epdm 45 grey	20100810-C0003	4.3	1.2	3.4	369	36,1	6,5
Epdm 55 black	20100810-C0004	6.9	1.9	4.8	413	42,9	7,6

Fig. 11 shows a variant wherein the fastening means 101 for a cord are integrated into the engaging means for squeezing the spring. On the underside of the embodiment can be seen how the engaging means can be attached to the spring by means of grippers 102. The spring is provided with strengthening ribs 106. In this embodiment sharper points for engaging on the wall are also covered in the rest state by the engaging means.

The embodiment of Fig. 12 shows an alternative to the fastening means for the cord. A fold-out hook 112 is provided for this purpose.

Shown in the embodiment of Fig. 13 are openings 114 for arranging therethrough a melt fixation for the engaging means.

The present invention has been described in the foregoing on the basis of several preferred embodiments. Different aspects of different embodiments are deemed described in combination with each other, wherein all combinations which can be deemed by a skilled person in the field as

falling within the scope of the invention on the basis of reading of this document are included. These preferred embodiments are not limitative for the scope of protection of this document. The rights sought are defined in the appended claims.

CLAIMS

1. Clamping device for clamping thereof between two surfaces arranged at an angle, such as walls, wherein the device comprises:
- a biasing body for imparting a bias to the clamping device,
- at least three engaging members arranged at respective suitable engaging positions arranged on the biasing body, wherein
- the biasing body is manufactured from a resilient material bendable substantially in one direction.

2. Clamping device as claimed in claim 1, wherein the biasing body is manufactured from a plate material, preferably comprising at least one opening and/or recess for the purpose of allowing a releasable fastening member to engage thereon.

3. Clamping device as claimed in claim 1 or 2, wherein the biasing body is manufactured from a metal and/or the biasing body comprises a leaf spring.

4. Clamping device as claimed in one or more of the foregoing claims, comprising operating means for operating the clamping device by means of fingers and/or hands.

5. Clamping device as claimed in claim 1 or 2, wherein the biasing body comprises a resilient plastic.

6. Clamping device as claimed in one or more of the foregoing claims, wherein the biasing body is suitable for

support in two dimensions, and is preferably suitable for forces in two directions.

7. Clamping device as claimed in one or more of the foregoing claims, wherein the biasing body is suitable for engaging on walls arranged at an angle of 40 degrees to 150 degrees, preferably 70-110 degrees, more preferably 80-100 degrees, and more preferably substantially 90 degrees.

8. Clamping device as claimed in one or more of the foregoing claims, wherein the biasing body is suitable for forming an arc within the corner, wherein both engaging members are preferably suitable for the purpose of providing a pushing force.

9. Clamping device as claimed in one or more of the foregoing claims, wherein the biasing body is suitable for engaging on walls arranged at an angle of 210 degrees to 330 degrees, preferably 250-290 degrees, more preferably 260-280 degrees and more preferably substantially 270 degrees.

10. Clamping device as claimed in claim 9, wherein the biasing body is suitable for forming an arc around the corner, wherein the engaging members are preferably suitable for the purpose of providing a pulling force.

11. Clamping device as claimed in one or more of the foregoing claims, comprising a releasable fastening member for fastening of an object thereto, wherein the fastening member more preferably comprises a safeguard such as a weakened portion.

12. Clamping device as claimed in claim 11, wherein the releasable connecting member is substantially rod-like and preferably provided with coupling means for fixing to an opening in the biasing body.

13. Clamping device as claimed in claim 11, wherein the releasable connecting member comprises at least two engaging members for engaging on oppositely arranged sides of the biasing body.

14. Clamping device as claimed in one or more of the foregoing claims, comprising shielding members for shielding the engaging members.

15. Clamping device as claimed in one or more of the foregoing claims, comprising deviation means for reducing a difference in displacement between the engaging members and the shielding members, these deviation means preferably comprising slots arranged in the biasing body.

16. Clamping device as claimed in claim 14 or 15, comprising releasable attaching means for the shielding members.

17. Clamping device as claimed in one or more of the foregoing claims, comprising at least one contact member for contact with at least one of the surfaces, wherein the contact member has attaching properties relative to the surfaces, such as are provided by a soft plastic or rubber with a high surface area solution, preferably a higher wear resistance, able to provide a very low creep relative to the surface, wherein the surface is preferably a very smooth surface to a rough surface such as that of P60 sandpaper.

18. Clamping device as claimed in claim 17, wherein the contact member can be placed removably relative to the engaging positions.

19. Suspension device embodied as a device as claimed in one or more of the foregoing claims, suitable for suspending objects of a maximum of 10 kg, preferably a maximum of 8 kg, more preferably a maximum of 6 kg, more preferably a maximum of 4 kg, more preferably a maximum of 2 kg, more preferably a maximum of 1 kg, more preferably a maximum of 500 g, more preferably a maximum of 250 g.

20. Method for manufacturing a device as claimed in one or more of the foregoing claims, comprising steps for:
- providing a plate material as starting material,
- removing the material for the biasing body from the plate material,
- forming the engaging members preferably together with the removal step.

21. Method as claimed in claim 20, comprising steps for supplying the plate material from a roll.

22. Method as claimed in claim 20 or 21, comprising steps for forming the operating means by means of forming steps such as injection-moulding.

23. Method as claimed in one or more of the claims 20-22, comprising steps for parallel arrangement of a device for the forming step and a device for the removal steps, steps for bringing together the biasing body and the operating

means and preferably steps for mounting the operating means on the biasing bodies while the biasing bodies are still partially attached to the roll, and subsequently separating the biasing bodies from the roll.

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24. Method as claimed in one or more of the claims 20-23, comprising steps for mounting the operating means by means of arranging a recess on the biasing body.

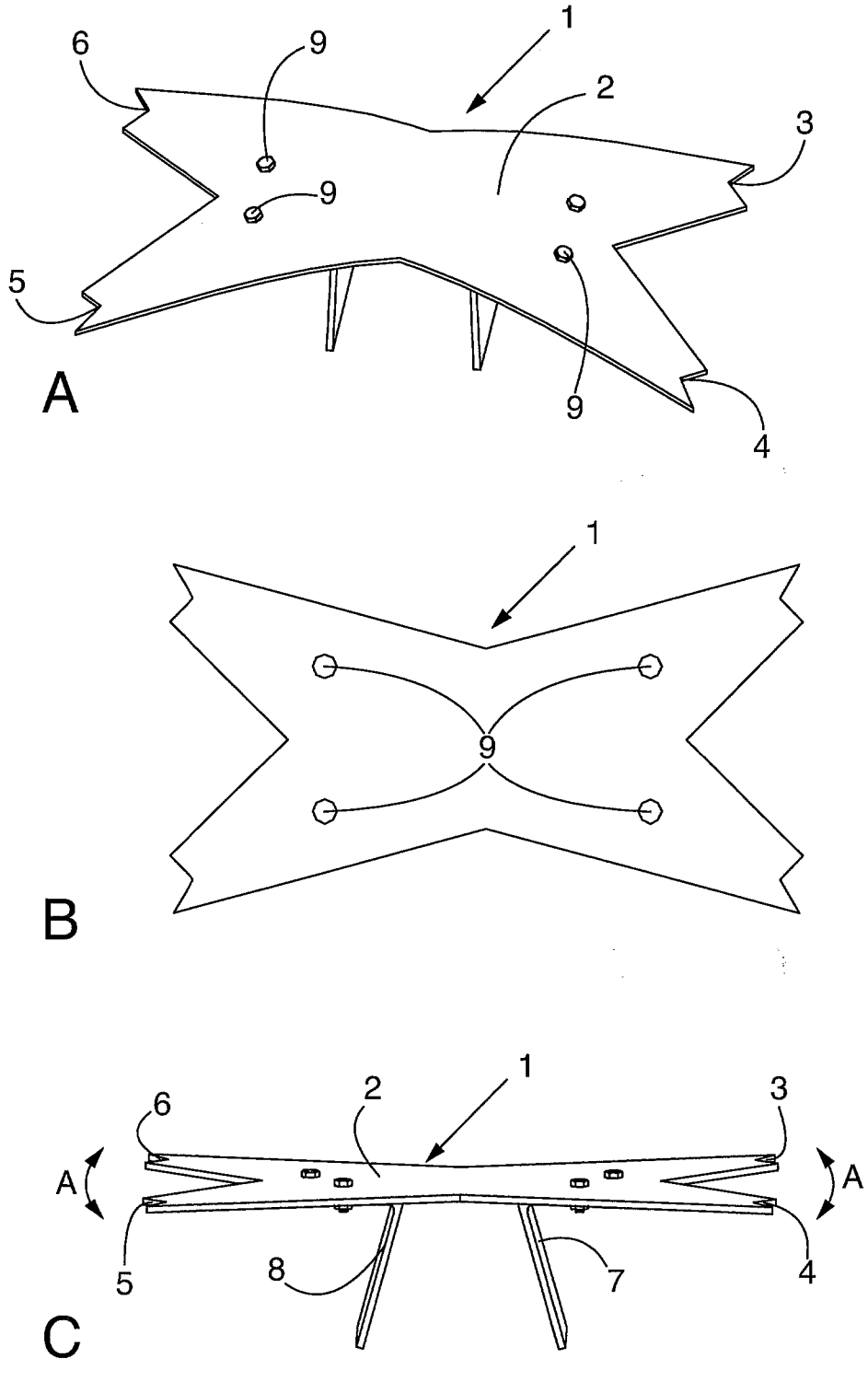

Fig. 1

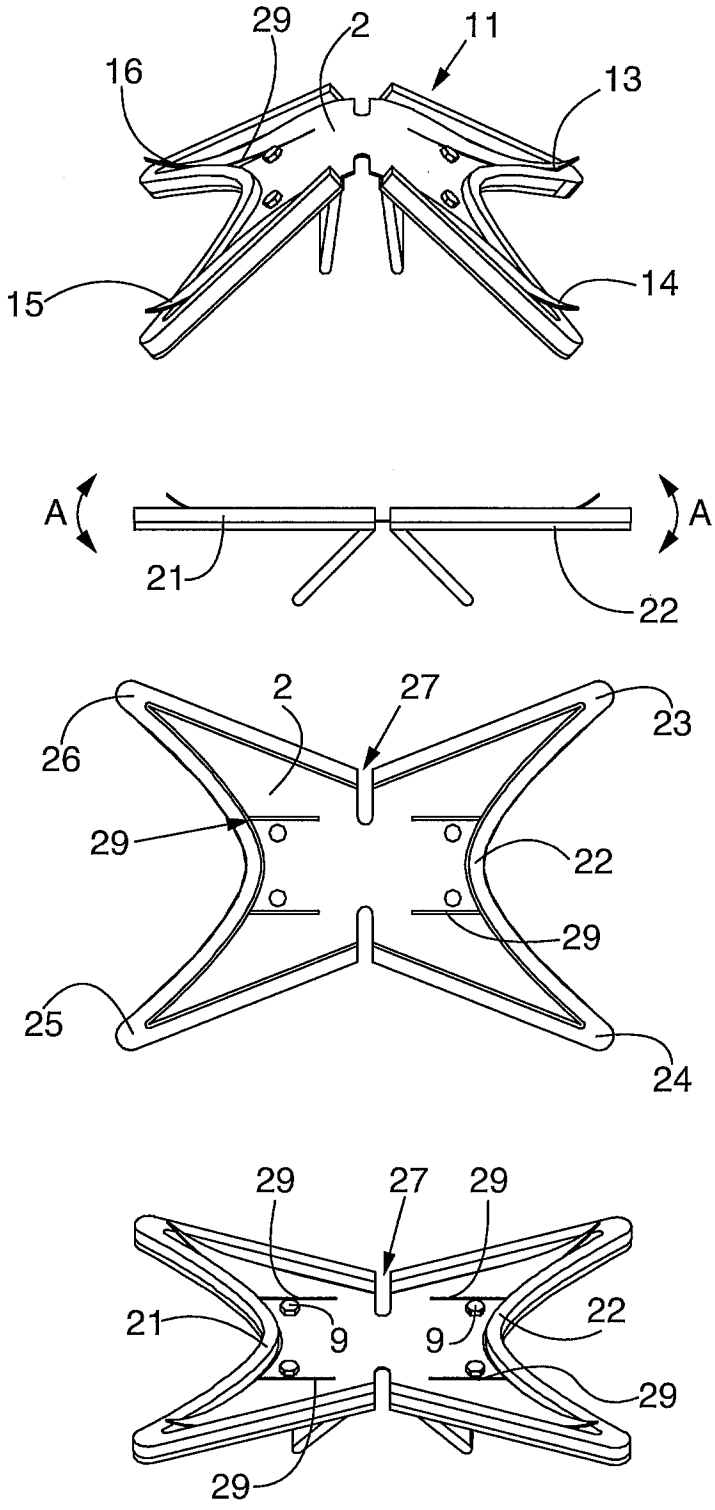
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Fig. 2

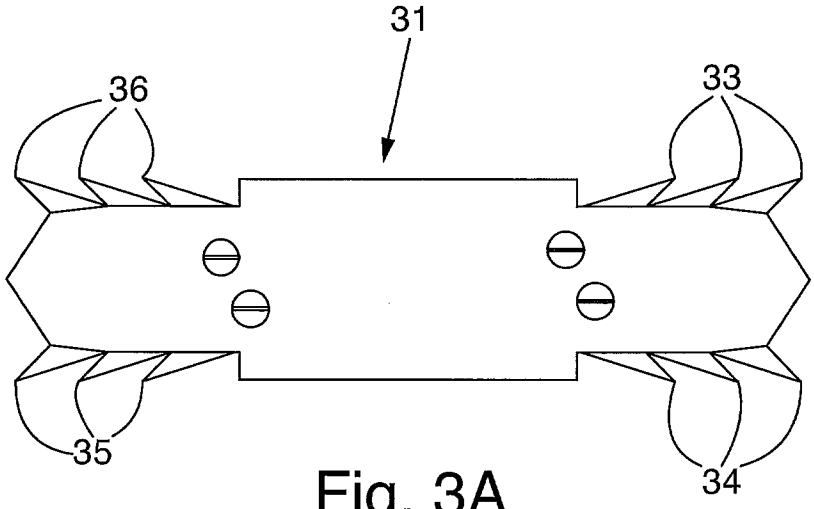


Fig. 3A

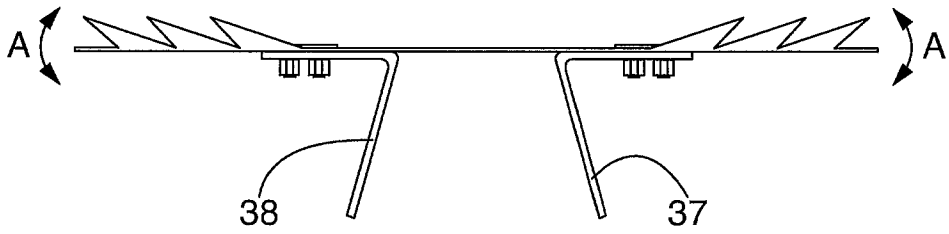


Fig. 3B

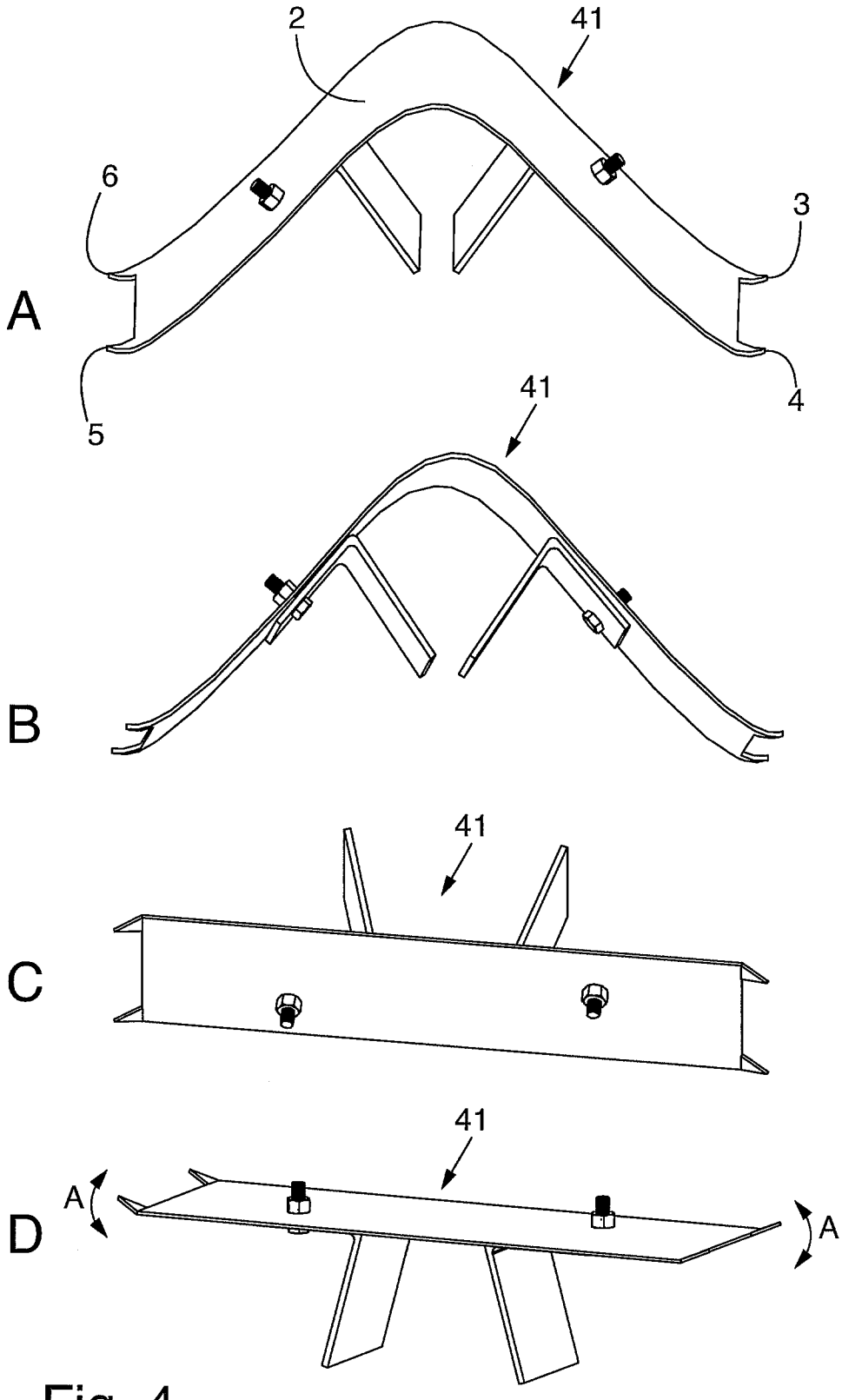
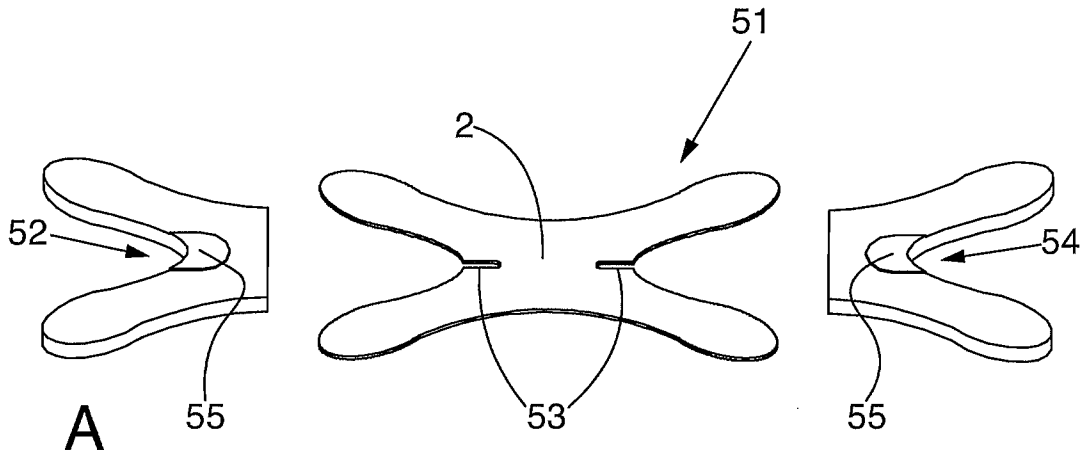
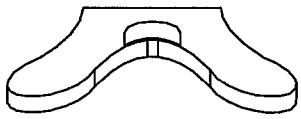


Fig. 4





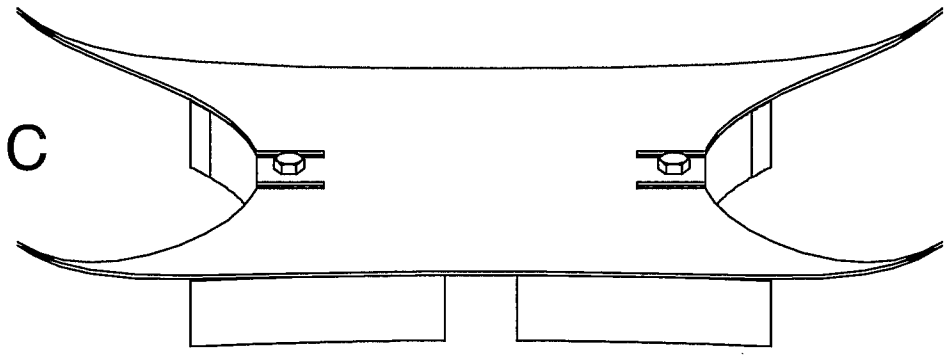


Fig. 5

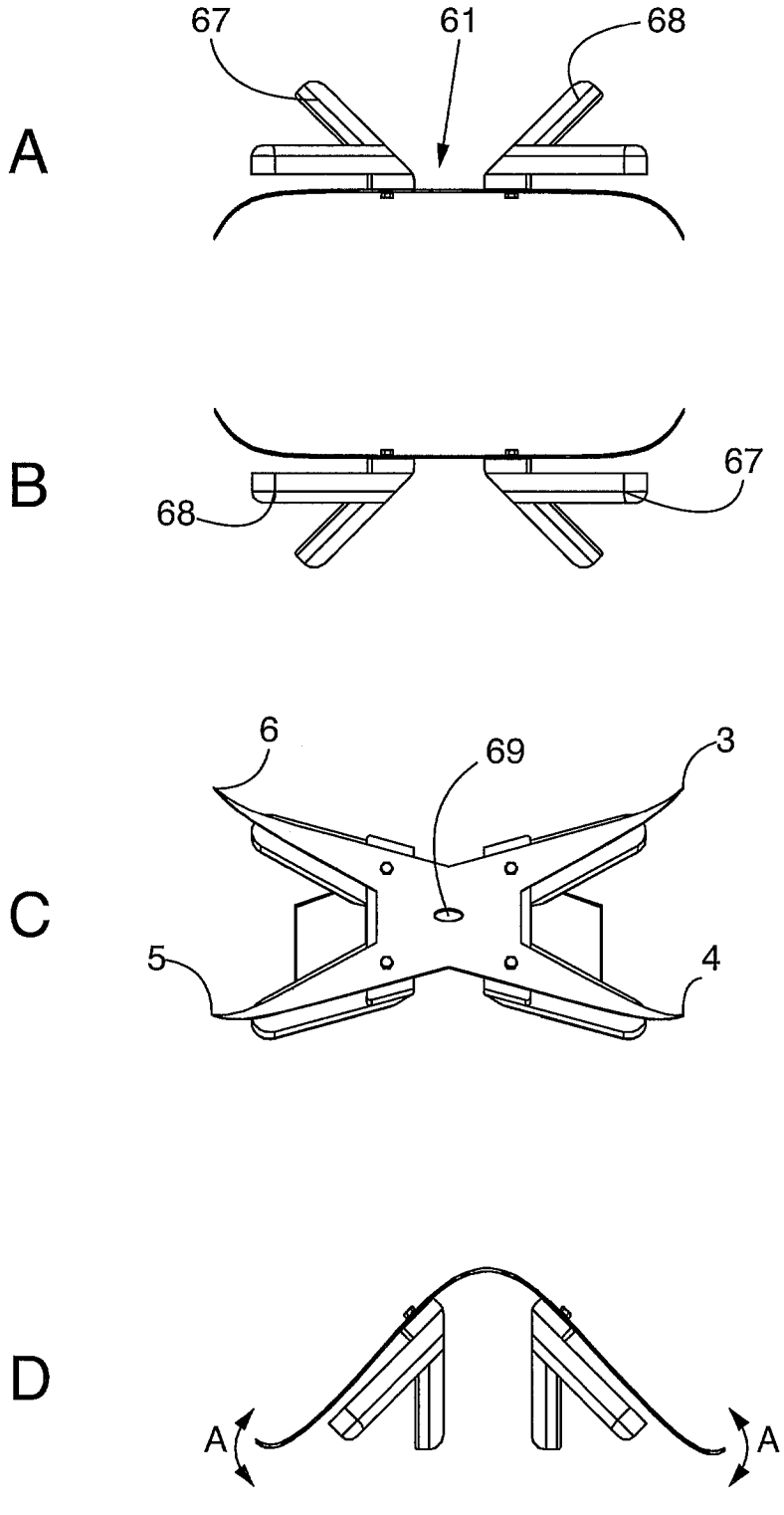


Fig. 6

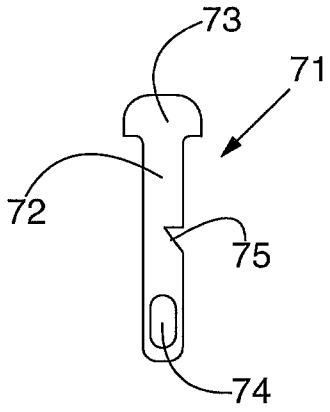


Fig. 7

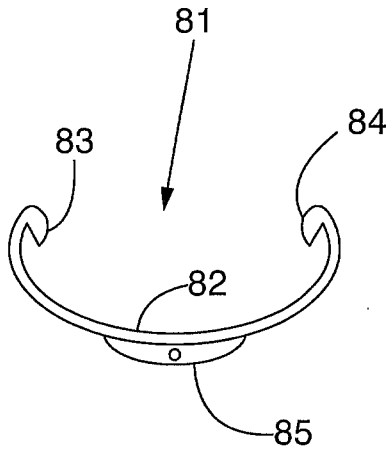


Fig. 8

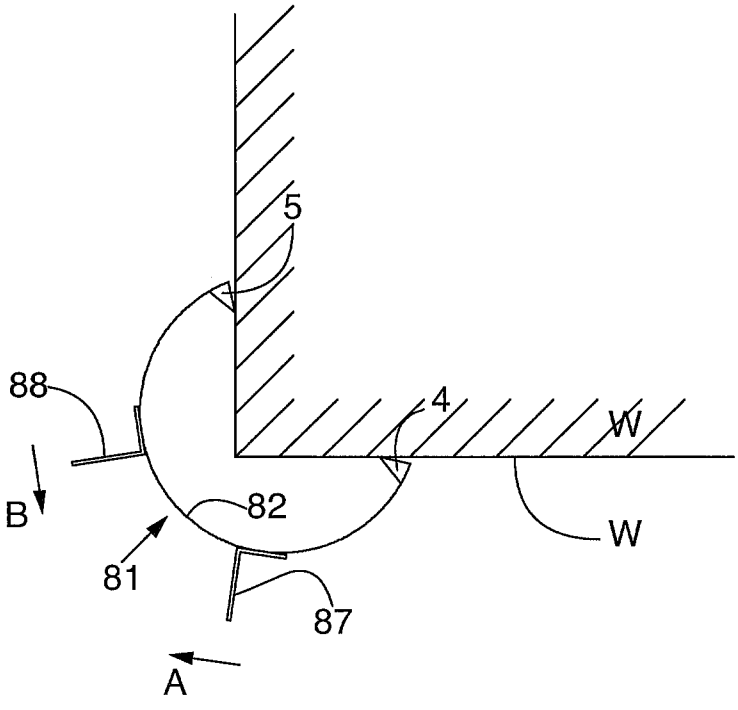


Fig. 9

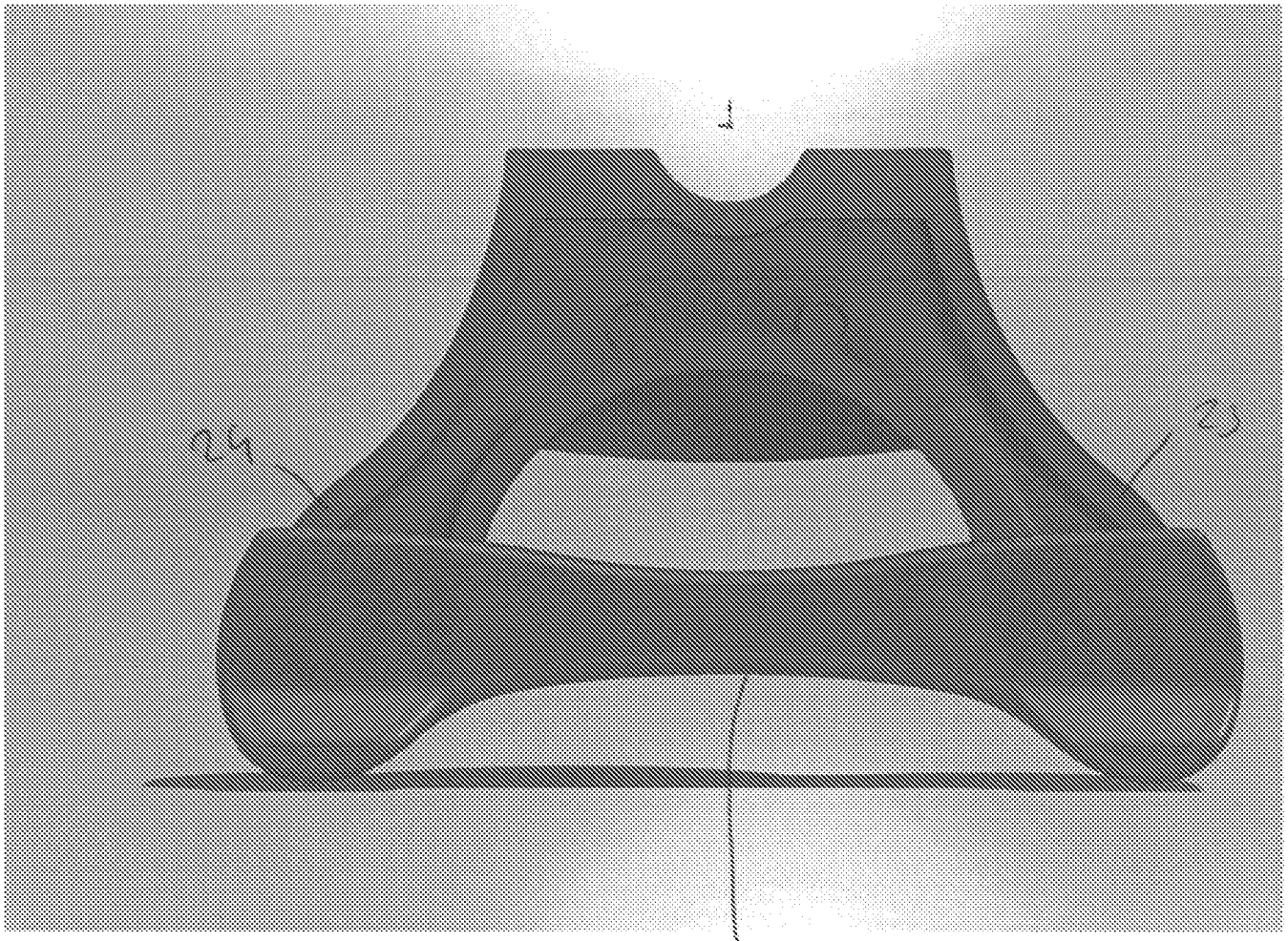


Fig 10

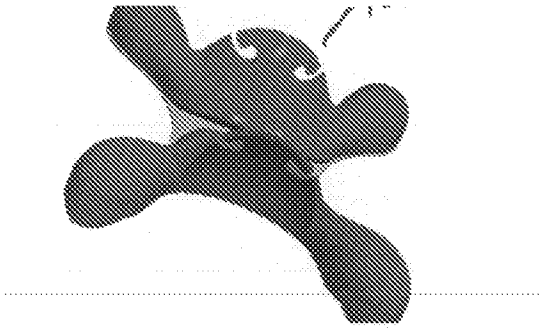


Fig 11 A

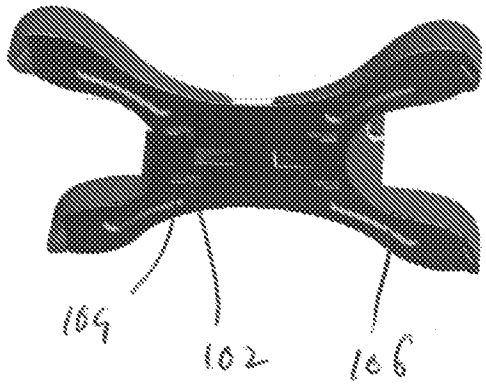


FIG 11B

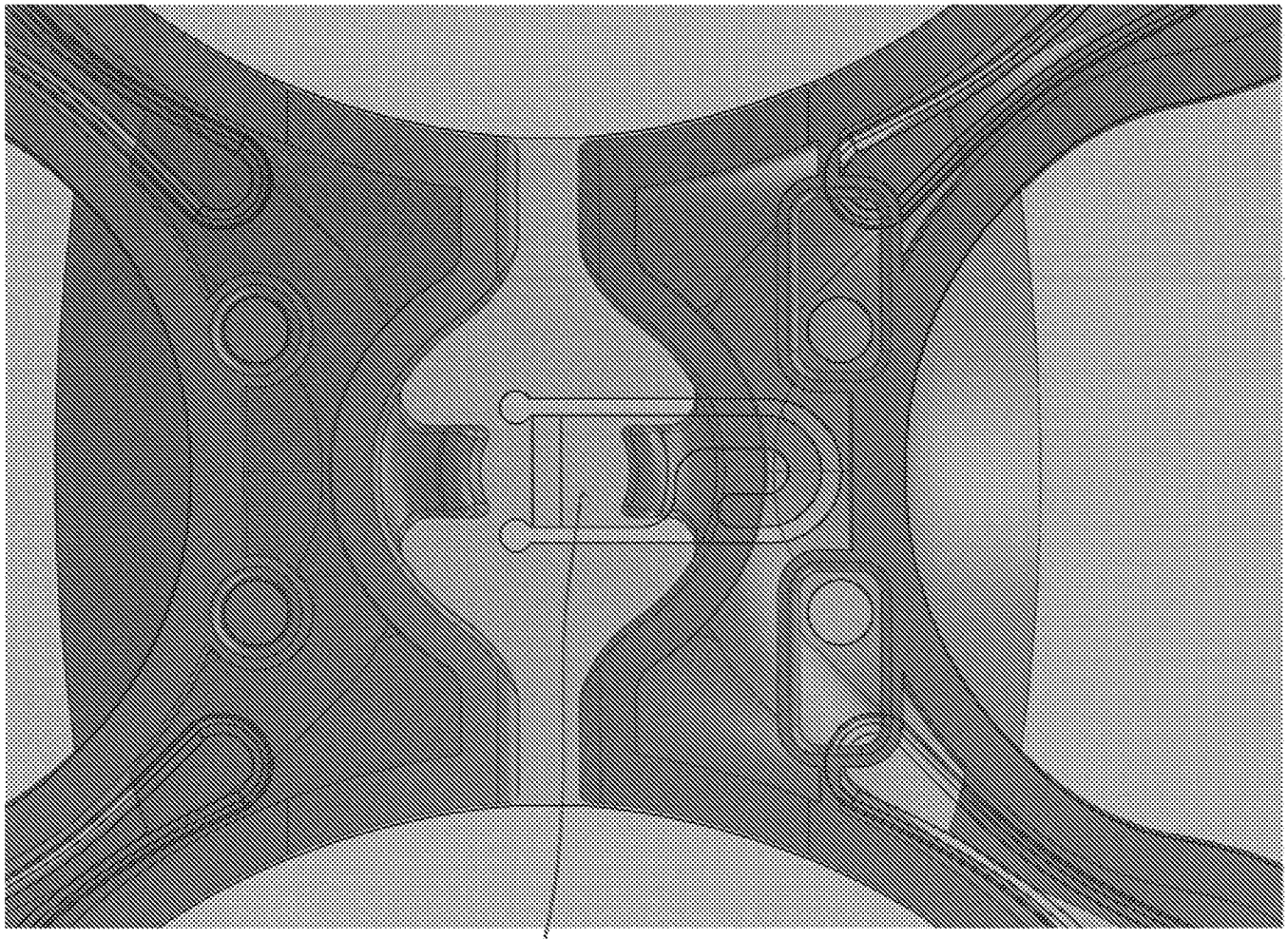


FIG 12

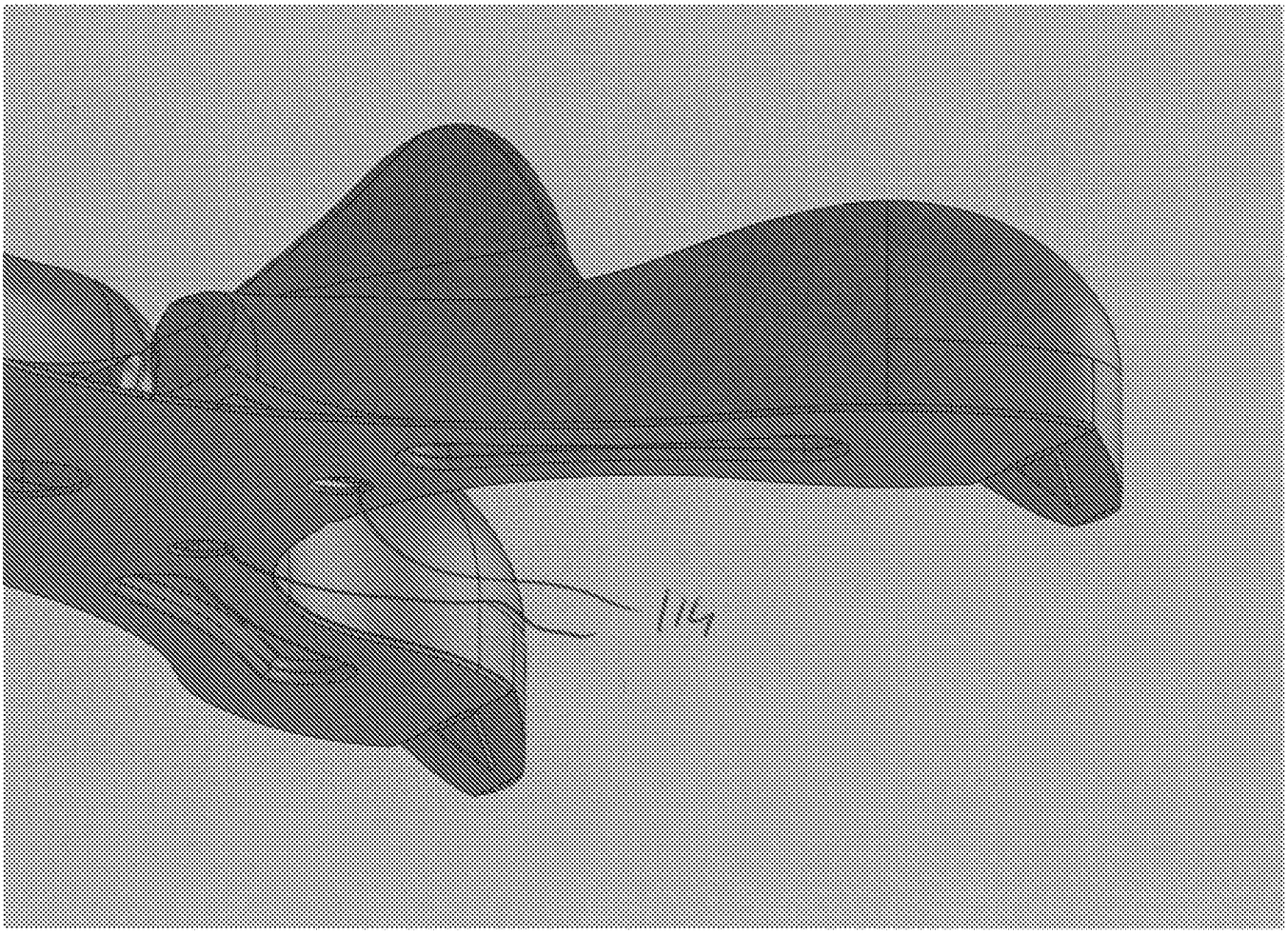


Fig 13